Environmental Emergencies

CBT 385

Part One *Recertification*

Part Two *Mastery*

Part One *Recertification*

Foreword

Possibly the most important piece of information to take with you is that each envionment you encounter exposes you to particular hazards. In order to avoid becoming a patient yourself, you need to be competent within an environment. It does not matter whether the environment is wilderness, swift water, hazardous materials, or some other situation; if you do not have the necessary knowledge and skills required to safely operate within that environment, you cannot effectively treat the patient. Be aware of your limitations. Seek appropriate training and practice the required skills.

Keith Keller, South King County Paramedic

Goals

1. **E**arly recognition
2. **M**eaningful intervention
3. **S**afe, rapid transport to the appropriate medical facility

Objectives

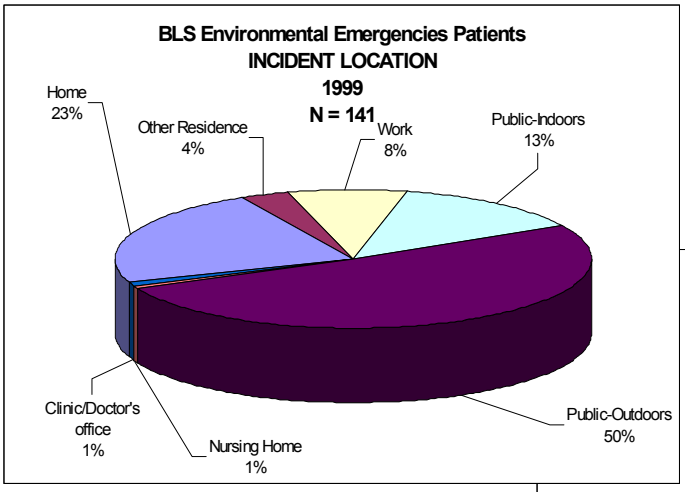
Performance Based

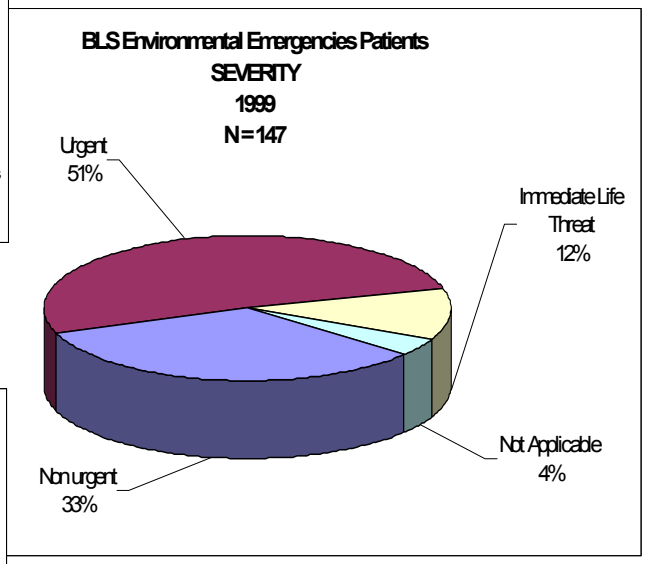
Given a partner, relevant equipment, and a patient with an environmental emergency, the EMT/FR will demonstrate treatment as specifically identified in the King County Emergency Medical Services BLS Patient Care Guidelines.

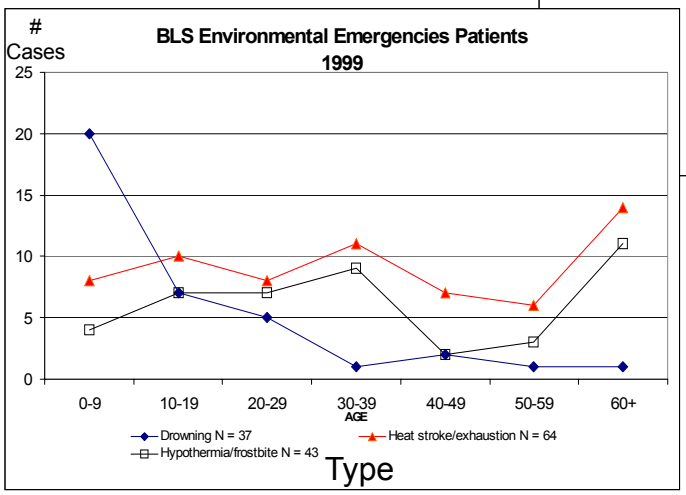
Cognitive Based

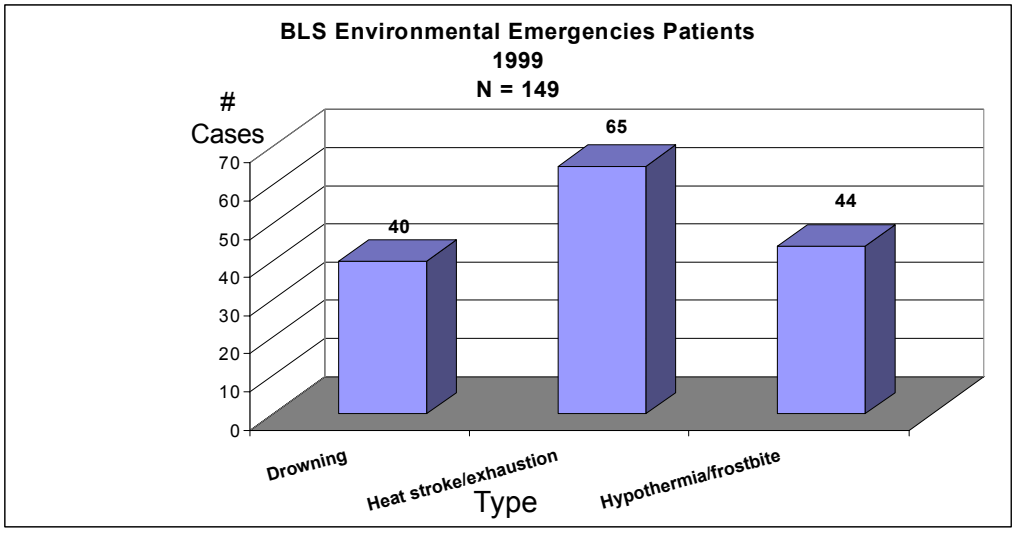
After studying the Competency Based Training (CBT) 385 Environmental Emergencies module, the EMT will verify cognitive learning by successfully passing a ten question written test by achieving a minimum score of 70%.

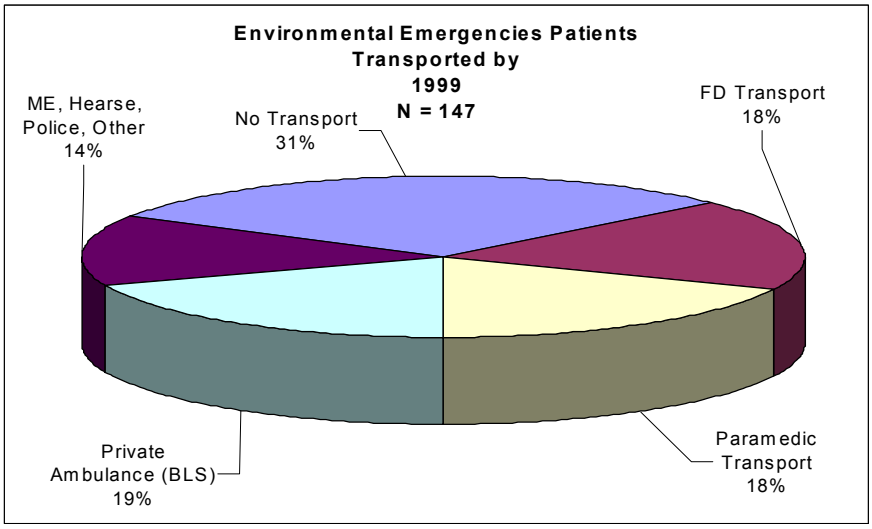
MIRF Facts

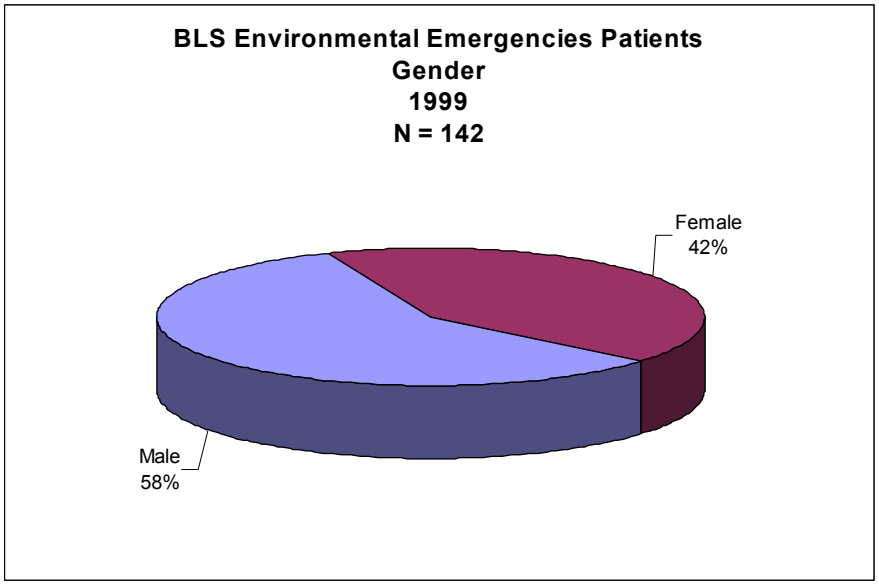

BLS Environmental Emergencies Patients
INCIDENT LOCATION
1999
N = 141
Home 23%
Other Residence 4%
Work 8%
Public-Indoors 13%
Clinic/Doctor's office 1%
Nursing Home 1%
Public-Outdoors 50%

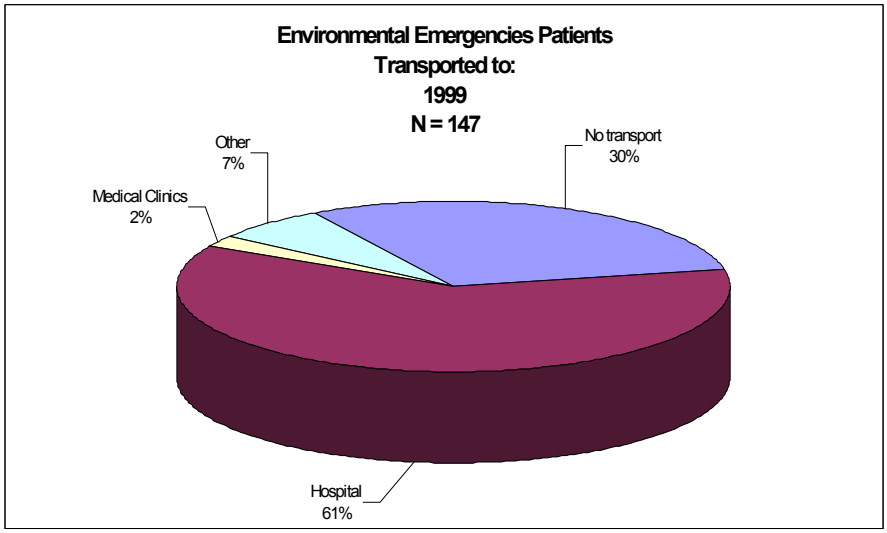

BLS Environmental Emergencies Patients
SEVERITY
1999
N=147
Urgent 51%
Immediate Life Threat 12%
Not Applicable 4%
Non urgent 33%


Cases
BLS Environmental Emergencies Patients
1999
25
20
15
10
5
0
0-9
10-19
20-29
30-39
40-49
50-59
60+
AGE
Drowning N = 37
Heat stroke/exhaustion N = 64
Hypothermia/frostbite N = 43
Type


BLS Environmental Emergencies Patients
1999
N = 149
# Cases
70
60
50
40
30
20
10
0
40
65
44
Drowning
Heat stroke/exhaustion
Hypothermia/frostbite
Type


Environmental Emergencies Patients
Transported by
1999
N = 147
ME, Hearse, Police, Other 14%
No Transport 31%
FD Transport 18%
Private Ambulance (BLS) 19%
Paramedic Transport 18%


BLS Environmental Emergencies Patients
Gender
1999
N = 142
Female 42%
Male 58%


Environmental Emergencies Patients
Transported to:
1999
N = 147
Other 7%
No transport 30%
Medical Clinics 2%
Hospital 61%

Medical Terminology

Internal Heat Sources

The human body tries to maintain a constant temperature by losing heat and producing heat. There are eight mechanisms involved in this balancing act between the body and the surrounding environment.

Metabolism The human body produces heat through the conversion of food to energy. All bodily functions, digestion, muscles contractions, breathing require energy and with its production heat is a by-product. The body's temperature-control mechanism, located in the hypothalamus region below in the brainstem, maintains a core temperature of about 98°F (37°C). There is a balance between production and loss.

Shivering Rapid contraction and relaxation of muscle tissues is a method for the body to produce more heat. Shivering can produce 40 times more heat than baseline metabolism by accelerating the consumption of food to heat.

Exercise The body can also produce heat through exercise. This happens as long as there is activity, fuel, oxygen, and water.

Factors affecting heat production

Core Temperature The colder a body is, the less able it is to produce adequate heat through metabolism. Hypothermia greatly reduces the body's ability to produce heat because cooling slows the chemistry of the body.

Medical Conditions Cardiac disease decreases the ability to compensate for heat stress. Endocrine diseases such as thyroid, adrenal, and insulin deficiencies may contribute to hypothermia. Strokes cause immobility with reduced

muscular activity. In addition the temperature control centers of the brain may be damaged.

Body Fluid Status Metabolism is not as efficient if the body is dehydrated. This is an important consideration for people who have been exposed to the environment for a long period of time.

Drugs/chemicals Beta-blockers decrease cardiac output and peripheral vascular control mechanisms. This effect works to lower body temperature.

Drugs such as cocaine and amphetamines, may contribute to hyperthermia (heat stroke) as they mimic stimulation of the sympathetic nervous system.

Phenothiazines are a class of drugs used to treat nervous, mental, and emotional disorders. In overdose cases, they can greatly increase body temperature. Examples of phenothiazines are: Haldol (haloperidol) Mellaril (thioridazine), Stelazine (trifluoperazine) Thorazine (chloropromazine)

Diuretics such as Lasix (furosemide) and HCTZ (hyrdrochlorothiazide) may cause dehydration, making the patient more susceptible to heat stress.

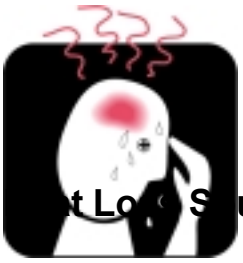
Alcohol Alcohol causes dilation of peripheral vessels as well as CNS, depression, which may adversely affect temperature control.

Energy Stores The body can maintain heat and cardiac output only as long as there is fuel to burn. Burning fuel keeps the core temperature up in a cold envi-

Student Notes	*Instructor Ideas*

ronment. Starvation or impaired metabolism as in diabetes will make temperature control more difficult.

External Heat Source



These include heat sources from the environment, such as the sun, fire, and chemical sources. Excess body temperature may result for exposure to prolonged periods of intense sunlight, elevated temperature of a fire scene or chemical exposure.

t Lo[illegible] S[illegible]urces

Conduction

Conduction is a transfer process by which heat moves between two touching objects from the warmer object to the colder object. It is the motion of molecules bumping into one another, like billiard balls that spread heat.

An example of conduction is holding a hot water bottle against your cold feet. The heat of the bottle increases the vibration of the skin molecules. These excited molecules then collide with other molecules, exciting them. In this way, heat energy is conducted through the foot. Pavement and the ground are good conductors of heat.

Conduction accounts for a significant percentage of heat loss under normal conditions. It is a major source of heat loss in the case of cold-water immersion. Water conducts heat 25 times more quickly than air.

Convection

Convection is the transfer of heat due to movement of a gas or liquid in response to a temperature or pressure differential. It occurs when a moving gas (e.g., air) or liquid carries heat from a warmer body to a cooler environment. It can also work in reverse, too, carrying heat from a warmer environment to a cooler one. Rising warm air from the earth's surface is an example of convection.

Another common example of convection occurs on a cold, windy day. Your body warms the layer of air surrounding it (by conduction and radiation). This warm, layer of air is rapidly removed by the wind. The body must produce more heat to warm the surrounding air. This process is commonly referred to the "wind chill effect." The same principle applies in moving water.

Heat energy is distributed more rapidly with the movement of a fluid. Convection is an efficient heat loss mechanism for a warm body exposed to the environment. Conduction and convection provide the ma-

jor routes of heat loss in cold-water immersion and strong wind.

Radiation

Radiation occurs when a warm body releases energy without direct contact with another body. Not only can heat energy travel by bumping molecules (as in conduction), it can also travel through electromagnetic waves. Be aware of the intense heat energy radiated by the sun when you are assessing a heat illness patient. In a dry, comfortable environment**,** most heat is lost from the body through radiation (50% – 60%) compared to other mechanisms.

Evaporation

Evaporation is the conversion of a liquid to a gas. If you heat a pan of water, the energy applied to the water will cause it to evaporate. This process requires a lot of heat because it takes quite a bit of energy to break water molecules apart and convert the liquid to a gas.

The human body takes advantage of evaporation by sweating. This process releases the body's excess heat. Since it requires a lot of energy to convert liquid water-to-water vapor, evaporation rapidly releases heat from the body. Evaporation is a very effective heat loss mechanism. Up to 30% of the body's normal heat loss is due to evaporation from the skin and lungs. Wet skin, relative humidity, and wind speed are all-important factors in heat loss through evaporation.

In cold environments, most of the heat loss is through convection and conduction. In hot environments, most of the loss is through evaporation.

Factors affecting heat loss:

Air Temperature

Temperature is an environmental factor that affects heat exchange by the body. The ambient air or water temperature directly affects body temperature.

Activity

Exercise produces heat. A patient who is temporarily immobilized by an injury, for example, a broken hip, can lose a significant amount of heat by convection to the surface beneath them, by radiation to the air above them and cannot produce more heat by exercising.

Humidity

A person gets cold faster in cool, humid air when compared to cool, dry air. Sweat evaporates more slowly in hot, humid air when compared to hot, dry air. The humidity, evaporation, cooling, temperature conditions affects how the body control rate will adjust to the climate at hand.

Body Size

and Fat The more volume a body has, the more heat it produces. Body fat is an insulator that holds in heat. A person with less body fat has a tendency to get cold faster than someone with more body fat.

Medical Conditions Abnormal circulation, metabolism, and medications may all contribute to

Temperatures you should know!

Event	Centigrade C°	to	Fahrenheit °F
Boiling	100		212
Body Temp	35.7		98.6
Room Temp	20		70
Freezing	0		32

Social conditions Homeless, social isolation, poverty, etc. are all factors that may contribute to abnormalities of temperature regulation.

Body Fluid Status A dehydrated person cannot sweat or produce heat effectively.

Student Notes	*Instructor Ideas*

1. Heat Related Illness

Heat related illness occurs when the body is overwhelmed by heat and cooling mechanisms such as radiation and evaporation become ineffective. Heat cramps, heat exhaustion, and heat stroke are progressive phases of the same disorder-called heat illness. Any conditions that increase heat production or decrease heat loss may lead to heat illness.

Heat Cramps

Heat cramps or muscle cramps maybe caused by an uneven distribution of body fluids and salts. Heat cramps result from the maldistribution of salt through perspiration. Muscle cramps from this condition can be mild to severe involving the extremities or the abdomen. Heat cramps can be relieved by rest and reduction in heat production and rehydration with (electrolyte sports drinks or water) and removal from the hot environment. The cramps may be accompanied by dizziness, weakness and nausea.

Heat Exhaustion

Heat exhaustion is a reduction in circulating blood volume due to loss of salt and water in sweat, and peripheral pooling due to vasodilatation. Clinical findings include:

- rapid, weak pulse
- temperature may be normal, slightly elevated or slightly lowered
- altered level of consciousness
- weakness, dizziness
- cool, clammy skin
- nausea, vomiting
- profuse sweating

Heat Stroke

Heat stroke is a life-threatening emergency that occurs when the body's heat-regulating mechanism fails. The patient may look identical to a heat exhaustion patient, except for malfunction of the central nervous system (decreased LOC or difficulty with walking or coordination). If you are uncertain as to whether someone is suffering from heat exhaustion or heat stroke, treat him or her for heat stroke.

Clinical findings of heat stroke include:

- rapid bounding pulse
- rapid, deep respirations
- skin usually hot and dry (may be damp if rapid onset)
- confusion and disorientation, progressing to unconsciousness
- dilated pupils
- seizures

Subjective	History

A SYSTEMATIC APPROACH TO PATIENT CARE

Subjective history will depend on the particular environment encountered. The chief complaint will help identify the problem.

The standard **SAMPLE** format of questioning should follow:
Symptoms

> **O**nset
> **P**rovoke
> **Q**uality
> **R**adiate
> **S**everity
> **T**ime

Allergies
Medications
Past History
Last Oral Intake
Events Leading Up To Incident

Significant History Symptoms of Heat related Illness

- chief complaint exposed to heat
- weakness or exhaustion
- dizziness or faintness
- muscular cramps
- nausea
- syncope

Student Notes	*Instructor Ideas*

Objective

Physical Exam

The physical exam is systematic and focused on the patient's chief complaint. When time permits, perform a more detailed exam that includes both the patient's front and back. Measure and document baseline vital signs and follow up with a second set at the end of the detailed physical exam. Unlike the subjective element of patient care, the objective element focuses on what you discovered during the exam. Usually, the physical exam finding fits with the patient's chief complaint.

Signs of heat illness include:

- altered LOC, seizures
- rapid deep respiration
- tachycardia
- hypotension < 90
- profuse sweating or may be hot, dry
- temperature elevation
- vomiting

NOTE:
Populations at risk for heat stroke include the elderly, athletes, and people who do strenuous work in hot, humid environments.

Student Notes	*Instructor Ideas*

Assessment	Impression

Determine type of environmental emergency and formulate treatment plan based on history and physical exam. Always consider the need for ALS intervention.

ALS Indicators (Sick)

- decreased/altered level of consciousness
- signs of shock
- heat exhaustion and dehydration with unstable vital signs
- heat stroke

Special Note: Be proactive and continually reassess the patient's vital signs

BLS Indicators (Not Sick)

- heat related cramps
- minor to moderate heat related complaint with stable vital signs

Student Notes	*Instructor Ideas*

Plan

Treatment

Most patients with heat illness can be managed by the EMTs in the field without Advanced Life Support intervention. However, a conservative approach to prehospital care will always pay dividends.

Cooling Strategies

Reduction of the body core temperature is the most important and first step in treatment. The preferred field treatments are to provide a cool environment, undress the patient and use ice packs to the large blood vessels.

If you apply water to the skin to encourage evaporation, use room temperature water so that you do not induce shivering by lowering skin temperature excessively.

When deciding where to transport a patient, keep in mind that small, rural hospitals may not be equipped to handle extreme heat emergencies.

Remember at the receiving hospital more appropriate treatment can be done to cool the body core temperature.

ALS Indicators

- decreased/altered level of consciousness
- heat stroke
- signs of shock and hypotension (BP < 90 systolic)
- heat exhaustion & dehydration with high likelihood of unstable condition during trans- port

BLS Indicators

- heat related cramps
- minor to moderate heat related complaint with stable vital signs

Management

- **request Medics (when ALS Indicators are present)**
- remove patient from the hot environment and place patient in a cool environment (back of air conditioned ambulance with air conditioner running on high)
- reassure and cool patient
- provide supplemental oxygen and/or ventilatory assistance as necessary
- loosen or remove clothing
- apply cool packs to neck, groin and armpits
- keep skin wet by applying water by sponge or wet towels
- fan aggressively
- place patient in supine position with legs elevated
- if patient is responsive and not nauseated, have patient drink water
- if the patient is vomiting, place patient on left side
- monitor patient's vital signs

BLS Care

- loosen or remove clothing
- apply cool packs to neck, groin and armpits
- keep skin wet by applying water by sponge or wet towels
- fan aggressively
- place patient in supine position with legs elevated
- if patient is responsive and not nauseated, have patient drink water
- if the patient is vomiting, place on left side to prevent aspiration
- monitor patient's vital signs and temperature (if available)

Student Notes	*Instructor Ideas*

2. Cold Related Illness

Hypothermia

Hypothermia is cooling of the core body temperature below 95°F (35°C). It is caused by either loss of body heat or decreased heat production. Hypothermia is often found in the absence of adequate clothing, equipment, hydration and judgment.

There are three basic stages of hypothermia:

Stage	Core Temperature	Signs and Symptoms
1. Mild	98°F – 95°F	Shivering
2. Moderate	95°F – 90°F 90°F – 85°F	Intense shivering Impaired judgment Impaired speech Shivering decreases Erratic or jerky movements Poor muscle coordination
3. Severe	<80°F	Shivering stops Fixed and dilated pupils

Frostbite

Frostbite is termed either superficial or deep, depending on the extent of tissue death found after rewarming. There is little apparent difference on initial exam. All frostbite initially appears very pale and involves some numbness. Pain and tingling is common. If the skin feels wooden or waxy, the tissue injury is deeper. You may also see swelling and blisters may be present.

Frostbite is made more likely when there is alcohol consumption, smoking and poor circulation to the extremities.
Early hypothermia also contributes to peripheral vasoconstriction.
Injuries to the feet and hands account for 90% of all frostbite injuries.

Subjective

History

A SYSTEMATIC APPROACH TO PATIENT CARE

The standard **SAMPLE** format of questioning should follow:
Symptoms

> **O**nset, what and when did it happen?
> **P**rovoke,
> **Q**uality,
> **R**adiate,
> **S**everity,
> **T**ime, how long?

Allergies
Medications
Past History
Last Oral Intake
Events Leading Up To Incident

<u>Significant History and Symptoms of Cold related illness:</u>

- chief complaint exposed to cold
- stiff or painful muscles
- poor muscle coordination and erratic or jerky movements
- difficulty speaking

Frostbite occurs when tissue gets cold enough to freeze

- local injury with clear demarcation
- early or superficial injury
- blanching of skin
- loss of feeling and sensation in injured area and the skin remains soft

Late or deep injury

- white, waxy skin which feels firm to frozen on palpation
- swelling and or blisters may be present
- if thawed or partially thawed, skin may appear flushed with areas of purple and blanching or mottled and cyanotic

Objective	Physical Exam

The physical exam is systematic and focused on the patient's chief complaint. When time permits, perform a more detailed exam that includes both the patient's front and back. Measure and document ***baseline vital signs*** and follow up with a second set at the end of the detailed physical exam. Unlike the subjective element of patient care, the objective element focuses on what *you* discovered during the exam. Usually, the physical exam finding fits with the patient's chief complaint.

Signs of Cold related illness include:

- shivering
- decreased body temperature -hypothermia
- bradycardia
- hypotension
- cool or frozen skin
- altered LOC
- sluggish pupils
- loss of normal sensation and function
- spontaneous VF

Student Notes	*Instructor Ideas*

Assessment

Impression

Determine type of environmental emergency and formulate treatment plan based on history and physical exam. Always consider the need for ALS intervention.

ALS Indicators (Sick)

- altered level of consciousness
- temperature less than 95 degrees or a long period of exposure
- significant co morbidities, e.g. age, illness, circumstances, trauma, alcohol, drugs
- if VF is present limit to one set of shocks and then continue with CPR until medics arrive
- signs of shock(abnormal vital signs)

BLS Indicators (Not Sick)

- cold exposure, temperature > 95 degrees, normal vital signs and no abnormal LOC
- frostbite with temperature > 95 degrees, normal vital signs and no abnormal LOC

Special Note: Be proactive and continually reassess the patient's vital signs

Student Notes	*Instructor Ideas*

Plan	Treatment

Most patients with cold related illness can be managed by the EMTs in the field without Advanced Life Support intervention. However, a conservative approach to prehospital care will always pay dividends.

MANAGEMENT

Request Medics (when ALS Indicators are present)

- assess ABCs and treat as indicated with modifications:
  - check rhythm with monitor (for manual Defib Tech only)
  - if no pulse is detected after 1 minute, begin CPR
  - if pulse is present, withhold CPR regardless of rate.
  - provide high flow oxygen with ventilations via pocket facemask or BVM (using oxygen inlet)
  - use AED if needed shock 3 times and then continued with CPR until medics arrive
- if patient's torso feels cool to a bare hand, check a core temperature if possible
- keep flat and remove wet clothing
- reassure and warm the patient
- administer appropriate oxygen therapy
- check and record distal circulation, motor function and sensation
- apply heat packs to arm pits, groin, and neck. Turn on heater in aid car insulate with blankets
- prepare "Aid Car" temperature 80 F
- transport to the nearest appropriate hospital A.S.A.P.

Student Notes	*Instructor Ideas*

Plan continued...

TREATMENT FOR FROSTBITE

- remove patient from the cold environment and protect the patient from further heat loss
- protect cold injured part from further injury
- remove any constricting or wet clothing and replace with a dry bulky dressing
- splint the injury and do not let them walk or use affected extremity
- remove jewelry
- do not rub or message injured tissue
- transport to an emergency room

Special Note: Do not rewarm frozen tissue unless transport time will exceed 2 hours and it is certain that the thawed tissue will not refreeze. Obtain medical direction prior to initiating rewarming. Rewarming should be done with 100-105°F water. Do not use Dry heat it heats unevenly and may burn frozen tissue. Stop rewarming when the tissue turns red-purple and becomes pliable.

Student Notes	*Instructor Ideas*

3. Water Related Emergencies

Pathophysiology of Drowning and Near-Drowning

Drowning is death caused by hypoxia following submersion in water.
Near drowning is submersion in water that does not result in death.
When a person inhales water it can stimulate spasms in the larynx and bronchi causing aspiration into the lungs. The patient can rapidly become anoxic (in a state without oxygen) with hypotension, bradycardia, and cardiac arrest.

Determination of submersion outcome:

Duration of Submersion

The longer under water the more likely is death due to drowning.

Water Temperature

The temperature of the water is an important factor in how long someone can survive without oxygen. Temperature factors which protect submersion victims include: *Diving reflex* which causes slowing of the heart rate and *total body cooling which* reduces cellular O_2 demand and prevents cellular death.
Cold water (less than 70°F) drowning victims can survive for up to one hour without oxygen. The record for a successful resuscitation was for a 3-year-old child who was immersed for 66 minutes in 33°F water. Children often survive longer because they cool faster than adults. Some studies indicate that temperatures need to be below 50°F for any significant chances of survival to occur after long immersion.

In the Pacific Northwest, shallow water is seldom below 50°F during the peak use months of summer. Even cold river water warms as it passes downstream. The shallow waters of the lakes and Puget Sound may approach 65°F late in the summer. Submersion times of greater than 10 minutes make successful resuscitation unlikely in most normothermic (warm water) drowning victims. Survival from long submersion times is more likely when the brain cools fast enough to receive protection from hypoxia. People who cool before they drown (e.g. hanging onto the ice or an overturned boat) have a better neurological outcome.

Deep water is generally colder and most lakes are about 35–40°F in the lower depths. The lower levels of Puget Sound are around 45°F. In general, the colder the water, the greater the chances of survival. Regardless of submersion time, remember that the hypothermic victim is not considered dead until he/she is warm and dead.

Fresh or Salt Water

The detailed physiology of drowning varies between fresh and salt-water submersions. But the BLS treatment is the same.

Co morbid conditions

Spinal injuries are seen in many water-related accidents. Diving into shallow water is a common mechanism for head and spinal injury and subsequent drowning. If there is any potential for a spinal injury, stabilize the cervical spine while in the water, if possible.

Other co morbid conditions associated with drowning include skeletal injuries and soft tissue injuries, drug or alcohol intoxication and other underlying medical conditions.

SCUBA

Self Contained Underwater Breathing Apparatus is a popular sport in the King County area. Most diving occurs without problems, but the use of compressed air or other gases in the underwater environment has it's own inherent hazards.

In addition to drowning, they include Decompression Illness (DCI or the bends), barotrauma, and air embolism. In addition, breathing contaminated compressed air can cause loss of consciousness, which may result in drowning. Deep dives (more than 70 feet or so) may cause nitrogen narcosis or oxygen poisoning which may alter the level of consciousness.

Decompression Illness (DCI) occurs when nitrogen that is dissolved in the blood forms bubbles due to a rapid ascent. The bubbles collect in the tissues and interfere with blood flow. In order for DCI to occur, the dive must have occurred at a depth of 33 feet or more. The longer and deeper the dive, the more nitrogen that is dissolved in the blood. The recommended rate of ascent to avoid DCI is 30 feet per minute. Dehydration, exertion and traveling by air within 12 hours after diving all increase the probability that DCI may occur.

Symptoms vary widely, depending on where the bubbles collect. Joint pain, abdominal pain and neurological symptoms are common. The take home message is that any diver who complains of feeling ill after diving should be evaluated for DCI. Symptoms may appear rapidly (within a few minutes of surfacing) or may take hours.

Student Notes	*Instructor Ideas*

Subjective	History

A SYSTEMATIC APPROACH TO PATIENT CARE

After establishing a rapport with the patient and obtaining consent to treat, identify the patient's chief complaint, and follow SAMPLE/OPQRST investigation

The standard **SAMPLE** format of questioning should follow:

Symptoms

> **O**nset, what and when did it happen?
> **P**rovoke, Mechanism, what causes it?
> **Q**uality,
> **R**adiate,
> **S**everity,
> **T**ime, how long?

Allergies
Medications
Past History
Last Oral Intake
Events Leading Up To Incident

Significant history and symptoms of water related emergencies

- chief complaint (drowning or near-drowning)
- length of submersion
- temperature of the water
- fresh or salt water
- depth of water
- water contamination
- consider the potential for spinal injury
- evaluation for other co morbid factors
- SOB
- coughing/choking

Subjective continued...

Significant History for all Diving Emergencies:

- number of dives in past 24 hours
- depth of dive
- length of time underwater
- problems encountered while diving
- significant medical history
- current medications

Student Notes	*Instructor Ideas*

Objective	Physical Exam

Signs of Water related emergencies include

- altered LOC
- respiratory distress
- tachycardia/bradycardia
- cyanosis
- spontaneous VF
- sluggish pupils
- hypothermia
- cardiac arrest

Descent problems (squeeze problems)

Significant Physical Findings:

- pain in lungs
- pain in sinus
- pain in middle ear
- pain in teeth
- pain in face around the mask

Ascent problems

Air Embolism and Pneumothorax

Significant Physical Findings

- blotchy or itching of the skin
- frothy blood in the nose and mouth
- dizziness/Vomiting
- blurred or distorted vision
- possible paralysis or coma
- dysphasia (difficulty speaking)
- bloody sputum
- decreased breath sounds unilaterally
- air under skin of chest or neck
- severe pain in muscles, joints, or abdomen
- dyspnea and or chest pain

Objective continued...

Decompression illness

Significant Physical Findings:

- Mottled skin
- Rash
- Headache
- Severe pain in the joints, muscles, chest in abdomen
- Muscular cramps
- Paralysis or numbness
- Exceedingly tired following a dive

Barotrauma

Significant Physical Findings:

- Mild to severe pain of affected area
- Bloody fluid or discharge from the nose or ears
- Dizziness
- Hemorrhage from the tiny blood vessels in the eyes

Student Notes	*Instructor Ideas*

Assessment	Impression

Determine type of water related emergency and formulate treatment plan based on history and physical exam. Always consider the need for ALS intervention.

ALS Indicators (Sick)

- decreased/altered level of consciousness
- signs of shock
- submersion of greater than 3 minutes
- temperature of less than 96 degrees
- symptoms or findings of scuba related emergency
- significant co morbidity, e.g. injury, intoxication
- no pulse or respiratory arrest
- severe Hypothermia

BLS Indicators (Not Sick)

- water related accident including aspiration of water, injury in diving or swimming with normal CNS function and vital signs

Student Notes	*Instructor Ideas*

Plan	Treatment

Most patients with water related illness can be managed by the EMTs in the field unless they have ALS indicators and Advanced Life Support intervention is needed. However, a conservative approach to prehospital care will always pay dividends.

Management

- **request Medics if necessary**
- remove the victim from the water; do not become a victim yourself
- in-line immobilization and removal from water with a backboard if spine injury is suspected or patient is unresponsive
- if there is no suspected spinal injury, place patient on left side to allow water, vomitus and secretions to drain from upper airway
- administer appropriate oxygen therapy or assist with ventilations
- expect vomiting; have suction available
- if no pulse and non-breathing patient follow the defib and CPR protocols
- elevate injury if possible and check/record distal **c**irculation, **m**otor function and **s**ensation
- prepare “Aid Car” temperature 70F
- transport to the nearest appropriate hospital
- monitor patient’s vital signs

Student Notes	*Instructor Ideas*

Plan continued...

Treatment for Air Embolism and Pneumothorax

- request Medics if indicated
- Provide basic life support if needed.
- Position patient on left side with head and chest lower than feet, this prevents air bubbles from moving to lungs, heart and brain
- Administer high flow oxygen by mask.

Treatment for Barotrauma (Decompression Sickness)

- keep patient calm and quiet.
- position comfortably with head up.
- request immediate paramedic evaluation or transport to Harborview hospital.
- in scuba ALS for possible decompression sickness

Special Note: The hyperbaric chamber in our area is at Virginia Mason Hospital via Harborview Medical Center.

Student Notes	*Instructor Ideas*

4. Stings and Bites

Pathophysiology

Mammal (including human) bites typically cause lacerations and punctures, and carry a risk of infection. Rabies is exceedingly rare but is a concern with a mammal bite. Snakes indigenous to King County are non-poisonous, but sometimes people keep poisonous snakes that they have acquired elsewhere as pets.

Marine animals such as sharks and urchins may have spines, which contain proteins that usually cause a local reaction, but may occasionally involve an anaphalactoid response. Some tropical species (e.g. Lionfish) found in people's aquariums might also cause envenomation. The jellyfish present in Puget Sound have venom that has a low toxicity, as do the local octopi.

Some insects and spiders inject a poison when they bite or sting. The severity of the reaction depends on the type and size of the animal; the age, size, and health of the person; and other factors. The only common poisonous spider in the area is the hobo spider. According to WSU, black widows are rarely encountered.

It is important to distinguish between a normal reaction to a bite or sting, which may include bleeding, swelling, and/or pain, and a severe allergic reaction, which may progress to life-threatening anaphylaxis.

Allergic reactions and anaphylaxis are described in CBT 932 1999

Student Notes	*Instructor Ideas*

Subjective	History

A SYSTEMATIC APPROACH TO PATIENT CARE

Determine type of sting and bite emergency and formulate treatment plan based on history and physical exam. Always consider the need for ALS intervention.

The standard **SAMPLE** format of questioning should follow:
Symptoms

> **O**nset, what and when did it happen?
> **P**rovoke, Mechanism, what causes it?
> **Q**uality, describe
> **R**adiate,
> **S**everity, rate from one to ten?
> **T**ime, how long?

Allergies
Medications
Past History
Last Oral Intake
Events Leading Up To Incident

<u>Significant History and Symptoms of Stings and Bites</u>

- chief complaint (Sting or Bite) type of animal or insect.
- pain
- redness and /or swelling
- lung sounds
- Weakness and dizziness
- chills or fever
- nausea
- anxiety

Objective	Physical Exam

Signs of Stings and Bites include:

- swelling
- anxiety, a sense of impending doom
- bradycardia
- hypotension
- dypsnea
- cyanosis
- flushed skin
- altered LOC
- hives/rash

Student Notes	*Instructor Ideas*

Assessment

Impression

Determine type of environmental emergency and formulate treatment plan based on history and physical exam. Always consider the need for ALS intervention.

ALS Indicators (Sick)

- anaphylaxis
- unstable vital signs

BLS Indicators (Not Sick)

- usual bite or sting with local reaction
- stable vital signs
- no anaphylaxis

Special Note: Be proactive and continually reassess the patient's vital signs

Student Notes | *Instructor Ideas*

Plan	Treatment

MANAGEMENT

- **request Medics if indicated**
- ABC's and vitals
- administer oxygen as needed
- if stinger is present, scrape the sting site to remove the stinger
- reassure the patient
- wash area
- remove jewelry from affected limb before swelling begins, if possible
- stop bleeding if present
- bandage and immobilize site of injury
- treat for shock
- Epi pen if indicated
- medical control for unusual bites or stings

Student Notes	*Instructor Ideas*

5. Altitude Illness

Above elevations of 8000 feet, the lower air pressure, in particular the lower oxygen pressure, creates problems with human physiology. The body can accommodate to the higher elevation, but if not given time to adjust, the patient will develop signs of altitude illness.

These include Acute Mountain Sickness, High Altitude Cerebral Edema (HACE), and High Altitude Pulmonary Edema (HAPE). Since there are no elevations above 8000 feet in King County, any patient you see (having been brought from somewhere outside the county) will have been already treated by the simple means of bringing them down in elevation. We will not go into detail about assessment and treatment, other than to say that they should be evaluated at a hospital.

If you are involved in Search and Rescue in situations, which subject you to the risk of altitude illness, you may find more information by checking out the Learning References and Resources. (Most likely, EMTs in King County will not see altitude sickness).

Student Notes	*Instructor Ideas*

APPENDIX A

TRANSPORTATION DECISIONS

1. Leave at scene

BLS Indicators with little or no potential for patient to worsen
EMT feels confident that patient is responsible for self-care, or that another responsible party is present
EMT urges patient to call back if further concerns or problems arise
EMT reminds patient to follow up with private MD if appropriate
Patient refusal signed ONLY if (a) EMT believes patient SHOULD go to medical facility and (b) patient refuses treatment/transportation

2. Patient's Own Vehicle (POV)

BLS Indicators with little or no potential for patient to worsen with further evaluation or treatment needed responsible transportation is available

3. BLS Aid Car/Private Ambulance

BLS Indicators
Further evaluation or treatment needed
Continued BLS assessment, oxygen or other treatment needed en route
No other responsible transport available
Patient requires stretcher for transport

4. ALS

ALS Indicators
Continued ALS assessment or treatment needed during transport

DESTINATIONS DECISIONS

1. Self-care

BLS Indicators with little or no potential for patient to worsen

EMT feels confident that patient is responsible for self-care, or that another responsible party is present

EMT urges patient to call back if further concerns or problems arise

EMT reminds patient to follow up with private MD if appropriate

Patient refusal signed ONLY if a) EMT believes patient SHOULD go to medical facility and b) patient refuses treatment/transportation

2. Clinic or Doctor's office

BLS Indicators with little or no immediate portntial for patient's condition to worsen

Need for further evaluation and treatment

Facility is available and capable of assessing and treating the patient

Facility agrees to see patient

Patient has transportation to and from the facility

3. Hospital Emergency Room

ALS or BLS indicators with need for further medical evaluation and treatment

No other facility appropriate or available to see patient

Learning References and Resources

AAOS Emergency Care and Transportation of the Sick and Injured Seventh Edition Jones and Bartlett Publishers, http://www.info@jbpub.com

High Altitude Medicine Guide
http://www.high-altitude-medicine.com/

Virtual Naval Hospital, GMO manual
http://www.vnh.org/GMO/ClinicalSection/15AcuteAltitudeIllnesses.html

Wilderness Medicine, Management of Wilderness and Environmental Emergencies, 3rd Ed., Paul S. Auerbach, Ed., Mosby, St. Louis 1995

Allergic reactions and anaphylaxis are described in CBT 932 1999 epi-pen

http://hobospider.org/

http://whatcom.wsu.edu/ag/homehort/pest/hobo.html

Hypothermia resources
http://www.hypothermia.org

http://www.diversalertnetwork.org/medical/articles/index.asp

Student Notes	*Instructor Ideas*